Air Quality Addendum

British Museum

Great Russell Street, London, WC1B 3DG

13 October 2023

ENVIRONMENTAL AND
SUSTAINABILITY CONSULTANTS

encon associates

Report Reference Number: A5788

Document Control

Date of first Issue	Revision	Date of Revision	Issued By	Checked by
13 October 2023	-	-	JK	MB

Executive Summary

Encon Associates undertook an air quality assessment in March 2023 in support of the redevelopment of a building located to the rear of Montague House, off Montague Street and to the east of the main British Museum, within the area of the British Museum Site incorporating the ERB and the green huts, Great Russell Street, London (the 'Site'). The proposals are for the demolition of the ERB and green huts to the northeast of the Museum site and the construction of a new building to primarily house plant to support the British Museum.

Two emergency lifesaving diesel generators will be installed within the new building with emissions to air via two vertical flues terminating 1 m above the roof of the building. Operation of each generator will be limited to 30 minutes per month for testing and maintenance (i.e. each generator will operate for no more than 6 hours per year). Only one generator would be in operation at any one time and emergency operation would only occur in the unlikely event of a fire or a loss of mains power.

Following submission of the application and air quality report Camden Council (CC) have raised concerns with the impact of the two life-saving diesel generators, providing the following comments:

'Impact on NO2 concentrations:

Whilst you are correct in that the short-term objective limit for local authorities allows for up to 18 exceedances of the 1-hour limit of 200 ug/m3, this is a limit to be enforced across the entire borough of Camden and so we must consider this when assessing all developments

- *Therefore in the worst case scenario you have identified below, the generator testing could result in 12 of the permitted 18 exceedances (and this is assuming the generators are not required for anything other than testing) allowed within Camden.*
- *Were this approach to be taken then there would be considerably more than 18 exceedances across the borough, given the amount of other buildings with backup generators*

It is also worth noting that Camden Council have formally adopted the World Health Organization's 2021 standards for air quality, which are considerably stricter than the UK legal limits'

This addendum report has been produced to assess the impact of the proposed life-saving generators on local air quality due to concerns raised by Camden Council.

Detailed dispersion modelling of NO_x, PM_{10} and $PM_{2.5}$ emissions from the emergency diesel generators has been undertaken which shows that impact on long-term concentrations will be less than 1% of the annual mean objectives and therefore impacts will be negligible. The modelling has also shown that the risk of an exceedance of the short-term air quality objectives for NO_2 and PM_{10} at nearby receptors is less than 1%, indicating that exceedance of the short-term objectives is highly unlikely.

The result of the modelling shows that the impact of the life-saving generators on local air quality would not be significant.

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1 Introduction

Encon Associates undertook an air quality assessment in March 2023 in support of the redevelopment of a building located to the rear of Montague House, off Montague Street and to the east of the main British Museum, within the area of the British Museum Site incorporating the ERB and the green huts, Great Russell Street, London (the 'Site'). The proposals are for the demolition of the ERB and green huts to the northeast of the Museum site and the construction of a new building to primarily house plant to support the British Museum.

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Following submission of the application and air quality report Camden Council (CC) have raised concerns with the impact of the two life-saving diesel generators, providing the following comments:

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- *Were this approach to be taken then there would be considerably more than 18 exceedances across the borough, given the amount of other buildings with backup generators*

It is also worth noting that Camden Council have formally adopted the World Health Organization's 2021 standards for air quality, which are considerably stricter than the UK legal limits'

This addendum report sets out the results of a detailed modelling exercise to predict the impact of emissions from the life-saving diesel generators on local air quality. It is recommended that this report is read in conjunction with the original air quality report published by Encon Associates[1].

[1] Encon Associates (2023) Air Quality Assessment Report – British Museum London – Ref. A5788, 10 March 2023

3 Policy Context

Full details of the policies and guidelines relevant to this development are set out in the previous Air Quality Assessment Report compiled by Encon and have not been repeated here. However, the objective limits set out within the relevant policy and guidance for use within this assessment are provided below for ease of reference.

3.1.1 Air Quality Regulations

The Air Quality Standards Regulations 2010[2] and Air Quality EU Exit Regulations 2019[3] sets out a series of limit values for the protection of human health. Table 3.1 presents the objectives for NO_2 and PM_{10}, the two key pollutants of concern within Camden.

In relation to $PM_{2.5}$ new legal targets are set out in the recently published Environmental Improvement Plan (EIP) 2023[4], and recently published Statutory Instrument 'The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[5]. Although legally binding, it is central government's responsibility for meeting these future targets. Local Authorities currently have no statutory obligation to achieve these targets. For the purposes of this assessment the limit value for $PM_{2.5}$ (as provided in Table 3.1) is considered to be appropriate to apply for this assessment. However, the new targets set out in the EIP are also provided in Table 3.1 and given consideration within the report.

Additionally, the Mayor of London has committed to meeting the World Health Organisation (WHO) guideline of 10 µg/m^3 by 2030.

The DEFRA predicted baseline concentrations currently exceed the Mayors commitment and the EIP long-term target. However, the GLA has prepared a roadmap to compliance and have identified additional measures that are not within the DEFRA predictions (such as the Ultra-Low Emission Zone (ULEZ) expansion and tightening of Low Emission Zone (LEZ) requirements for HGVs). The impacts from this development are not considered to have the potential to compromise adherence

[2] Air Quality Regulations 2010 – Statutory Instrument 2010 No. 1001
[3] Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 – Statutory Instrument 2019 No. 74
[4] HM Government, Environmental improvement Plan 2023, First Revision of the 25 Year Environment Plan
[5] The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 – Statutory Instrument 2023 No.96

to this roadmap. Furthermore, it is expected that the Government will introduce measures to reduce PM2.5 concentrations throughout the UK to achieve the 2040 target for this pollutant.

Table 3.1: Relevant Objectives set out in the Air Quality Strategy

Pollutant	Concentrations	Measured As	Date to be Achieved by
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1-hour mean	31 December 2005
	40 µg/m^3	Annual mean	31 December 2005
Particulate Matter (PM_{10})	50 µg/m^3 not to be exceeded more than 35 times per year	24-hour mean	31 December 2004
	40 µg/m^3	Annual mean	31 December 2004
Particulate Matter ($PM_{2.5}$)	20 µg/m^3 (Stage 2 limit value by 2015 NAQO and EU Limit Value)	Annual Mean	31 January 2020
	10 µg/m^3 (Long-term Target)	Annual Mean	31 December 2040
	12 µg/m^3 (Interim Target)	Annual Mean	31 January 2028

3.1.2 Camden Clean Air Strategy 2019-2034 and Camden's Clean Air Action Plan 2023-2026

The Camden Clean Air Strategy (CCAS) and Clean Air Action Plan (CCAAP)[6] details Camden's long term strategic objectives for clean air in Camden and the actions that the Council intends to take over the next four years to improve air quality. The CCAS sets out a pathway for the Council to achieve stricter WHO air quality guideline limits throughout the borough by 2034 at the latest. These are

- NO_2: 10 µg/m^3 by 2034;
- PM_{10}: 15 µg/m^3 by 2030; and
- $PM_{2.5}$: 5 µg/m^3 by 2034.

The Council has also set interim targets for these pollutants to measure ongoing progress:

- NO_2: 30 µg/m^3 by 2026 and 20 µg/m^3 by 2030;
- PM_{10}: 20 µg/m^3 by 2026; and
- $PM_{2.5}$: 10 µg/m^3 by 2030.

[6] London Borough Camden (2022) Camden Clean Air Strategy 2019-2034 and Camden Clean Air Action Plan 2023-2026, December 2022

4 Methodology

4.1 General Approach

The impact of emissions from the proposed generators has been assessed using the ADMS-Roads Extra dispersion model. The model has been run to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptor locations in the vicinity of the proposed building.

The modelling has been undertaken for five years of hourly sequential data from the London City Airport (2018 to 2022) to allow for inter-annual variability in the predicted concentrations.

The total predicted environmental concentration (PEC) has been calculated by adding the process contribution to the relevant background concentrations for NO_2, PM_{10} and $PM_{2.5}$.

In accordance with the Environment Agency Guidance[7], the short-term background concentrations (i.e. 1 hour NO_2 and 24-hour PM_{10}) is assumed to be twice the long-term background concentration.

Background concentrations for each pollutant have been taken from the Bloomsbury automatic monitoring site as presented in Table 4.1.

Annual mean concentrations for NO_2 and PM_{10} have been taken from 2022, however data capture for $PM_{2.5}$ was 60% during this year. The data is not therefore considered suitable for use in the assessment and data for 2019 has been used.

Table 4.1: Annual Average Concentrations Measured at London Bloomsbury (µgm^{-3})

Site	Year				Calculated Short-term Background Concentration
	2019	2020	2021	2022	
NO_2	32	28	27	26	52[1]
PM_{10}	18	16	16	17	34[1]
$PM_{2.5}$[2]	11	9	9	8	-

[1]calcualted as 2x annual mean

[2] data capture for 2022 was 60%, therefore the data is not considered suitable for use in the assessment. For $PM_{2.5}$ a background concentrations has been taken from 2019 (2020, and 2021 being excluded due to impacts associated with the COVID-19 pandemic)

[7] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

4.2 Emissions

4.2.1 Emission Parameters

The generator emission parameters are presented in Table 4.2. The data are based on a Perkins 4000 Series (4006-23TAG3A) 705 kW diesel engine.

Table 4.2: Emission Parameters

Parameter		Value
Stack Location		Generator 1 – OS 530078, 181799
		Generator 2 – 530080, 181796
Stack Height (above ground level) (m)		10.3
Stack diameter (m)		0.3
Temperature (^{0}C)		500
Actual flow rate (Am^3/s)		3.2
Exit Velocity (m/s)		44.8
Annual Operating Hours		6
NO_x mass emission rate (g/s)	Long-term	0.00149[1]
	Short-term	2.169[2]
PM_{10} mass emission rate (g/s)	Long-term	0.00006[1]
	Short-term	0.089[2,3]
$PM_{2.5}$ mass emission rate (g/s)	Long-term	0.00006[1]
	Short-term	0.089[2,3]

[1] adjusted to account for annual operating regime of 6 hours (i.e. short-term mass emissions x (6/8760)

[2] not adjusted for operating hours

[3] based on total particulate emissions therefore representing an overestimate of PM_{10} and $PM_{2.5}$ mass emissions

4.2.2 Short-term emissions

For assessing short-term concentrations (hourly and 24-hourly), worst-case emission limits have been assumed for the purposes of the modelling assessment and the plant is assumed to be operating continuously (24/7) to predict the number of exceedances of the 1-hour mean air quality objective for NO_2 and the 24-hour mean air quality objective for PM_{10} at discrete receptor locations.

Under normal operation, each generator would run for a maximum of 6 hours per year and only one generator would be in operation at any one time. As there are two generators, the total annual operation is equivalent to one generator operating for 12 hours per year. The assessment of short-term impacts has therefore been modelled based on one generator operating 24/7.

Assuming continuous operation of the generators takes account of the full range of meteorological conditions that occur over the course of a year. However, due to the limited operating hours, this is an excessively conservative approach that assumes that the operation is co-incident with the least favourable meteorological conditions for the dispersion of emissions.

The short-term air quality objective for NO_2 allows up to 18, 1-hour means above 200 µg/m^3 per year, while the short-term objective for PM_{10} allows for up to 35, 24-hour means above 50 µg/m^3 per year. As detailed in the government guidance[8] a hypergeometric distribution statistical analysis approach can be used to determine the number of exceedances per annum that would be equivalent to the objective based on the annual operating hours per year for each generator. It is only possible to calculate the number of exceedances per annum equivalent to the objective where the operating hours are equal to or above the allowable exceedances i.e. for NO_2 this would be an operating regime of 19 hours or more while for PM_{10} this would be an operating regime of 36 hours or more. In this instance the operating hours will be no more than 12. The hypergeometric distribution for each pollutant has therefore been based on the lowest number of possible operating hours, which represents a conservative approach to calculating the equivalent exceedances based on the actual operating regime.

A summary of the total number of predicted exceedances over a full year of operation (8,760 hours) that would result in a less than 1%, 5% and 10% risk of more than 18 exceedances per annum for NO_2 and more than 35 exceedances per annum for PM_{10} are presented in Tables 4.3 and 4.4.

[8] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

The ADMS model has been used to predict the number of hours per year that NO_x emissions from the generators would exceed 200 µg/m^3 and the number of 24-hour periods that PM_{10} emissions would exceed 50 µg/m^3.

Table 4.3: Hypergeometric Distribution for Exceedances of the 1-hour Mean NO_2 Objective (12 hours operation)

Risk of >18 Exceedances per Annum	Number of Exceedances (8760 operation hours)[1]
1%	6876
5%	7483
10%	7761
[1] calculated assuming 19 hours operation, therefore represents a conservative approach	

Table 4.4: Hypergeometric Distribution for Exceedances of the 24-hour Mean PM_{10} Objective (12 hours operation)

Risk of >35 Exceedances per Annum	Number of Exceedances (8760 operation hours)[1]
1%	323
5%	337
10%	343
[1] calculated assuming 19 hours operation, therefore represents a conservative approach	

4.2.3 Long-term emissions

For long-term concentrations (annual mean concentrations), the generators are assumed to be operating continuously but with the emission rate adjusted for the number of operational hours per year (6 hours per year per generator). On this basis, the model has been set up to assume the operation of the plant for the entire year, however the emissions have been reduced by a factor of (8760/6) in order that the total mass emission is released that would be the case for only 6 hours per year.

4.3 Building Effects

The presence of buildings close to emission sources can significantly distort the wind field, creating zones of increased turbulence and higher ground level concentrations closer to the stack (known as downwash). Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The proposed new building will be located between the existing British Museum building to the west and the terraced properties along Montague Street to the east. Both the British Museum and properties on Montague Street are taller than the proposed building and the emission flues will terminate below the height of these adjoining buildings.

To take account of building downwash the proposed new building and adjacent buildings discussed above have been included within the ADMS model.

A summary of the structures included within the model is provided in Table 4.5. The dimensions and orientations have been determined from a desktop review of local satellite images (google earth) and parameter plans of the proposed development.

Table 4.5: Building Information

Building	Easting	Northing	Height	Length	Width	Angle
Proposed New Building	530077	181803	9.3	30	10	147
Montague Street	530099	181806	17.9	150	15	143
British Museum (west)	530050	181722	23.3	135	102	147
British Museum (north-west)	530020	181824	23.3	17	45	147

4.4 Conversion of NO_x to NO_2

NO_x emitted as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

A conversion ratio of 70% NO_x:NO_2 for annual concentrations and 35% NO_x:NO_2 for 1-hour concentrations has been used in the assessment of NO_2 impacts, as recommended by Environment Agency guidance[9].

4.5 Sensitive Receptors

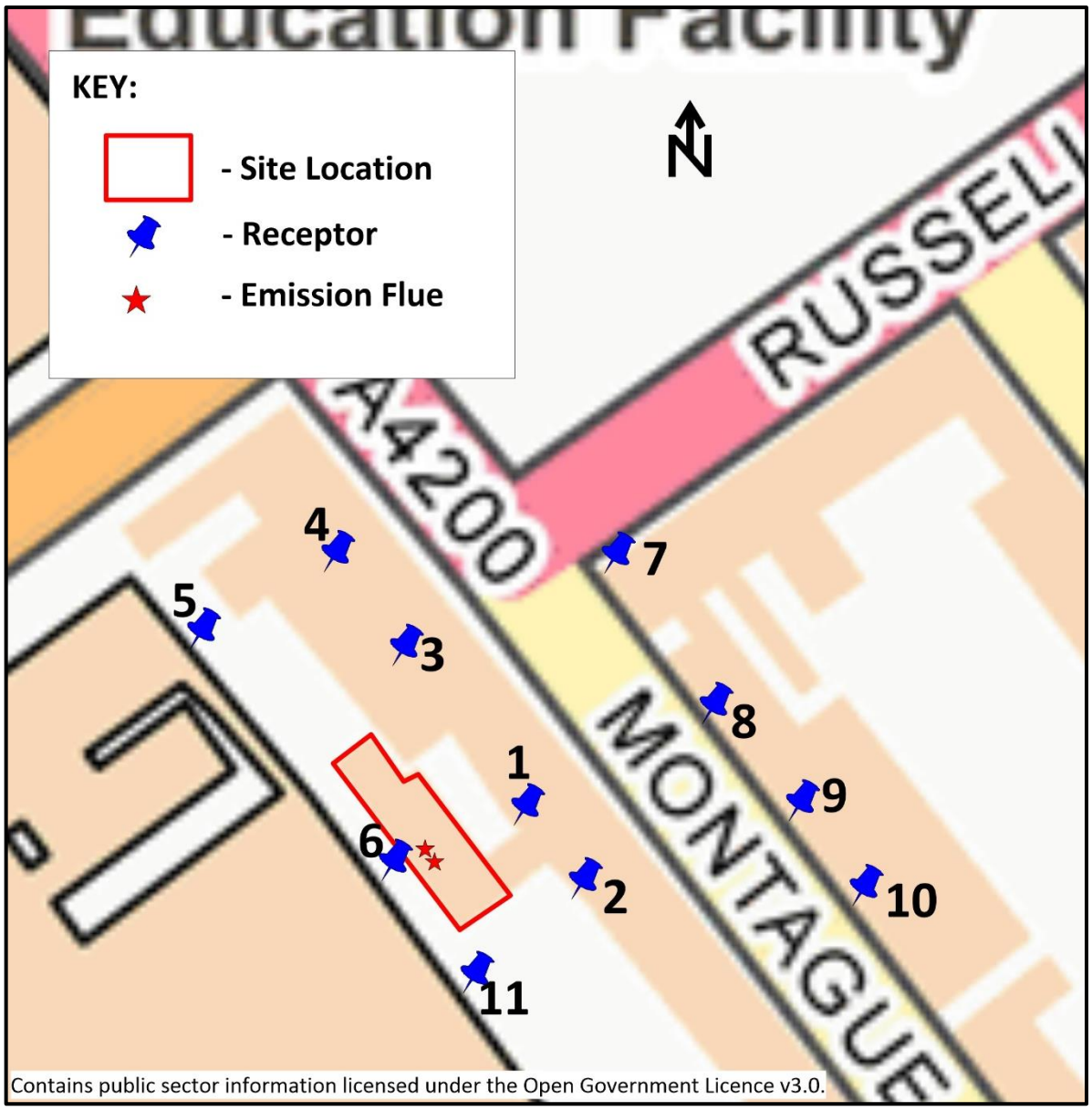
Details of the discrete receptor locations that have been included within the assessment are presented in Table 4.6. The location of each receptor is presented in Figure 4.1.

Table 4.6: Sensitive Receptors

Receptor ID	Description	Exposure Heights (m)	Easting	Northing
1	8 Montague Street	1.5, 4.5, 7.5, 10.5	530092	181802
2	6 Montague Street (Blooms Hotel)	1.5, 4.5, 7.5, 10.5	530102	181788
3	43 Montague Street	1.5, 4.5, 7.5, 10.5	530074	181827
4	41 Russell Square	1.5, 4.5, 7.5, 10.5	530064	181039
5	British Museum	1.5, 4.5, 7.5, 10.5	530041	181837
6	British Museum	1.5, 4.5, 7.5, 10.5	530067	181791
7	44 Russell Square	1.5, 4.5, 7.5, 10.5	530107	181844
8	The Montague on the Gardens Hotel	1.5, 4.5, 7.5, 10.5	530123	181817
9	The Montague on the Gardens Hotel	1.5, 4.5, 7.5, 10.5	530135	181801
10	The Montague on the Gardens Hotel	1.5, 4.5, 7.5, 10.5	530151	181782
11	British Museum	1.5, 4.5, 7.5, 10.5	530080	181771

[9] Environment Agency AQMAU, Conversion Rates for NOx and NO_2

Figure 4.1: Sensitive Receptors



4.6 Assessment of significance

4.6.1 Assessment of Long-term Impacts

Guidance issued by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)[10] relates to Air Quality considerations within the planning process and sets

[10] EPUK & IAQM, Land-Use Planning & Development Control: Planning for Air Quality, January 2017

criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Table 3.1. The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Table 4.7 below.

Table 4,7: Impact Descriptors for Individual Receptors

Long-term average concentration at receptor in assessment year	% Change in concentrations relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% of AQAL	Moderate	Major	Major	Major

AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Table 3.1

The percentage change in concentration should be rounded to a whole number

The table should only be used with annual mean concentrations

The descriptors are for individual receptors only: overall significance should be based on professional judgment

When defining the concentrations as a percentage of the AQAL use the 'without scheme' concentration where there is a decrease in pollutant concentrations and the 'with scheme' concentrations for an increase

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value i.e. well below, the degree of harm is likely to be small. As exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL

It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year, it is impossible to define the new total concentrations without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

4.6.2 Assessment of Short-term Impacts

The government guidance on assessing generators indicates that where the statistical probability of exceeding the short-term exceedance statistics is 1% or less then exceedances of the short-term objectives is considered to be highly unlikely.

Where the probability is 5% or less then exceedance of the objective is considered unlikely where the generator plant operational lifetime is no more than 20 years, while where the probability is more than or equal to 5%, there is the potential for exceedances of the objectives and measures must be implemented to reduce emissions and reduce the risk of potential exceedances.

The results of the hypergeometric distribution statistical analysis have been assessed based on the above approach to determine the risk of the generators resulting on a significant impact on short-term NO_2 and PM_{10} concentrations.

5 Predicted Impacts

5.1 Long-Term Impacts

The predicted annual mean PC and PEC (process contribution plus background) concentrations of NO_2, PM_{10} and $PM_{2.5}$ are set out in Table 5.1.

Table 5.1: Predicted Annual Mean Impacts due to Generator Emissions

Receptor	Receptor Height (m)	NO_2		PM_{10}		$PM_{2.5}$		Significance of Impact
		PC	PEC	PC	PEC	PC	PEC	
1	1.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.55	26.5	<0.01	17.0	<0.01	11.0	Negligible
2	1.5	0.06	26.1	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.06	26.1	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.06	26.1	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.12	26.1	<0.01	17.0	<0.01	11.0	Negligible
3	1.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.05	26.0	<0.01	17.0	<0.01	11.0	Negligible
4	1.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
5	1.5	0.01	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.01	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.01	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
6	1.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible

Receptor	Receptor Height (m)	NO_2		PM_{10}		$PM_{2.5}$		Significance of Impact
		PC	PEC	PC	PEC	PC	PEC	
	7.5	0.16	26.2	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.20	26.2	<0.01	17.0	<0.01	11.0	Negligible
7	1.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.06	26.1	<0.01	17.0	<0.01	11.0	Negligible
8	1.5	0.06	26.1	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.07	26.1	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.07	26.1	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.11	26.1	<0.01	17.0	<0.01	11.0	Negligible
9	1.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.05	26.1	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.05	26.1	<0.01	17.0	<0.01	11.0	Negligible
10	1.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.02	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
11	1.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
	4.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
	7.5	0.03	26.0	<0.01	17.0	<0.01	11.0	Negligible
	10.5	0.04	26.0	<0.01	17.0	<0.01	11.0	Negligible

The data shows that at all receptor locations from ground level up to 3rd floor level (10.5m) the annual mean PC is less than 0.2 µg/m^3 for NO_2 and less than 0.1 µg/m^3 for both PM_{10} and $PM_{2.5}$.The PC for all three pollutants is less than 1% of the relevant annual mean objectives as

discussed in Section 3.1.1. Based on the criteria set out in Table 4.7 the impact of the generators on long-term air quality will be negligible and therefore not significant.

5.2 Short-Term Impacts

5.2.1 Nitrogen Dioxide

The number of predicted hourly means exceeding 200 µg/m^3 at each receptor location is set out in Table 5.2.

Table 5.2: Predicted Exceedances of the NO_2 Hourly Mean (for continuous operation)

Receptor	Receptor Height (m)	Predicted Total Number of Hourly Means >200 µg/m^3	Probability of the Objective being Exceeded
1	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	6254	<1%
2	1.5	60	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	3044	<1%
3	1.5	48	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	1420	<1%
4	1.5	27	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	600	<1%
5	1.5	1	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	24	<1%

Receptor	Receptor Height (m)	Predicted Total Number of Hourly Means >200 µg/m^3	Probability of the Objective being Exceeded
6	1.5	6	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	2959	<1%
7	1.5	1	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	38	<1%
8	1.5	45	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	1259	<1%
9	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
10	1.5	0	<1%
	4.5	14	<1%
	7.5	0	<1%
	10.5	0	<1%
11	1.5	9	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	1191	<1%

The data set out in Table 5.2 shows that at all receptor locations the total number of hourly means exceeding 200 µg/m^3 predicted over the full dataset (8760) is less than 6876 (as detailed in Table 4.3) indicating a less than 1% probability that the 1-hour objective will be exceeded over the year as

a result of the monthly testing and maintenance of the lifesaving generators. Based on the details set out in Section 4.6.2, exceedance of the 1-hour objective is highly unlikely as a result of the proposed generators, therefore the impact on short-term NO_2 is considered to be not significant.

5.2.2 Particulate Matter (PM_{10})

The number of predicted hourly means exceeding 200 µg/m^3 at each receptor location is set out in Table 5.3

Table 5.3: Predicted Exceedances of the PM_{10} 24-hour Mean (for continuous operation)

Receptor	Receptor Height (m)	Predicted Total Number of 24-hour Means >50 µg/m^3	Probability of the Objective being Exceeded
1	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	114	<1%
2	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	10	<1%
3	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
4	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
5	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%

Receptor	Receptor Height (m)	Predicted Total Number of 24-hour Means >50 µg/m^3	Probability of the Objective being Exceeded
6	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	33	<1%
7	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
8	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
9	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
10	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%
11	1.5	0	<1%
	4.5	0	<1%
	7.5	0	<1%
	10.5	0	<1%

The data set out in Table 5.3 shows that at all receptor locations the total number of 24-hour means exceeding 50 µg/m^3 predicted over the full dataset (8760) is less than 323 (as detailed in Table 4.4) indicating a less than 1% probability that the 24-hour objective will be exceeded. Based on the

details set out in Section 4.6.2, exceedance of the 24-hour objective is highly unlikely as a result of the proposed generators, therefore the impact on short-term PM_{10} is considered to be not significant.

6 Conclusion

This addendum report has been produced to assess the impact of the proposed life-saving generators on local air quality due to concerns raised by Camden Council.

Detailed dispersion modelling of NO_x, PM_{10} and $PM_{2.5}$ emissions from the emergency diesel generators has been undertaken which shows that impact on long-term concentrations will be less than 1% of the annual mean objectives and therefore impacts will be negligible. The modelling has also shown that the risk of an exceedance of the short-term air quality objectives for NO_2 and PM_{10} at nearby receptors is less than 1%, indicating that exceedance of the short-term objectives is highly unlikely.

The result of the modelling shows that the impact of the life-saving generators on local air quality would not be significant.

Appendix A
Glossary of Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
μgm^{-3} micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1ug/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the

Term	Definition
	closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.